ANNUAL REPORT 1965

MARMORA

water treatment plant

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NOV 25 1966
ONTARIO WATER
RESOURCES COMMISSION

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Marmora Water Treatment Plant, OWRC Project No. 58-W-25.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET

TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

Members of the Marmora Local Advisory Committee,
Village of Marmora.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Marmora Water Treatment Plant, OWRC Project No. 58-W-25.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water treatment.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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MARMORA
water treatment plant

operated for

THE VILLAGE OF MARMORA

by the

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DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: D. A. McTavish
Operations Engineer: J. N. Dick

801 Bay Street Toronto 5

'65 REVIEW

The total operating costs that are absorbed by the OWRC have increased from $515.56 in 1964 to $923.28 in 1965. The increased cost is due mainly to an increase of $376.60 in chemical cost which is a result of a 27% increase in water consumption in 1965.

TOTAL OPERATING COST:

The total operating costs which include costs incurred by the OWRC as well as by the municipality are as follows:

Municipality Cost:	
Administration	300.00
Billing Cards to Residents	56.00
Operator's Salary	$2,756.00
Maintenance	43.35
	$3,155.35
OWRC Costs	923.28
Total	$4,078.63

Frequent inspections by head office engineers and technicians have found the plant well maintained and operated.

GLOSSARY

BTU	British Thermal Unit
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpm	gallons per minute
lin. ft.	linear feet
mgd	million gallons per day
pH	a symbol for hydrogen-ion concentration; a pH test determines the intensity of the acidity or alkalinity of a water
ppm	parts per million
ss	suspended solids
SWD	side wall depth
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)
turbidity	a measurement of the amount of visible material in suspension in water

HISTORY
1960 - 1965

INCEPTION

The Crowe River provides an ample quantity of water for the Village of Marmora, but the normal colour in the river is about 20 PPM. A study was made to determine the most suitable method of reducing this colour to tolerable limits. This study was conducted in 1960 by Sparkler International Limited under the direction of the OWRC.

The firm of R. V. Anderson and Associates, Toronto, Consulting Engineers, was engaged to prepare plans and specifications for the project.

CONSTRUCTION

The water treatment plant and appurtenances wereconstructed by Tatham Company Limited, Belleville. The standpipe was constructed by Horton Steel Works Limited, Fort Erie and the water mains constructed by Armstrong Brothers Company Limited, Brampton. The construction was completed early in 1962 and the Division of Plant Operations took over the supervision of the project. The project is operated by the Marmora Public Utilities Commission.

TOTAL COST

$ 212,977.01



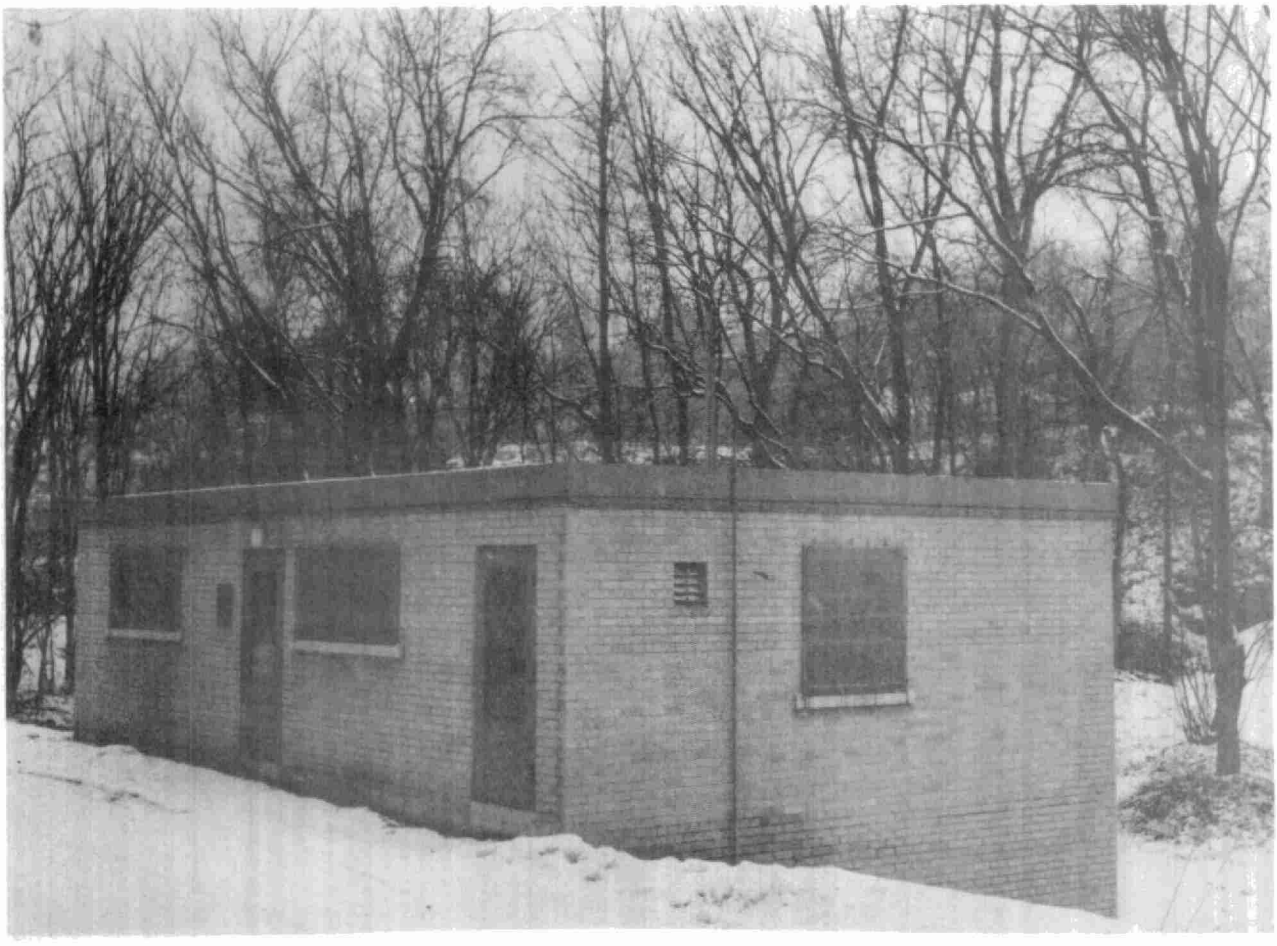
W. BISHOP
OPERATOR

Project Staff

COMMENTS

Mr. William Bishop is a municipal employee who has operated the treatment plant and distribution system since its completion early in 1962.

Frequent inspection of the Marmora project by OWRC head office engineers and technicians have found the plant well maintained and operated.



Description of Project

Water from Crowe Lake enters the system through a 10" screened intake in one of the old sluice-ways. The water depth at the intake is approximately 10 ft. and flows rapidly at all times of the year. The water flows by gravity from this point to the filtration room. A static head of approximately 2 ft. between the lake and the operating water level in the plant provides a sufficient supply to the system. The operating floor of the filter room is approximately 6" above lake water level, to prevent any possible overflow of the open detention and filter chambers.

A concrete overflow chamber receives water from the 10" intake line. An adjustable overflow weir establishes the operating water level in the detention and filter chambers. Water enters the filter side at any required rate and the rest of the incoming water spills into a drain pit, where it flows by gravity back to the river. This overflow chamber eliminates an automatic water level control valve. It also permits a rapid flow of water through the intake line, which prevents clogging or freezing.

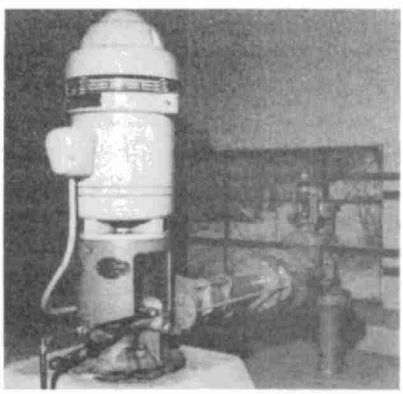
Water flows from this chamber, on the filter side, into a concrete detention chamber. The detention chamber is approximately 15 ft. long x 5 ft. wide and has up and down baffles. It provides 15 minutes detention at a flow rate of 150 Imperial gallons per minute. Powdered activated carbon is metered into

the water at the beginning of the detention chamber. This is fed by a Wallace and Tiernan A-690 volumetric feeder, which is equipped with a bag loader and dust collector

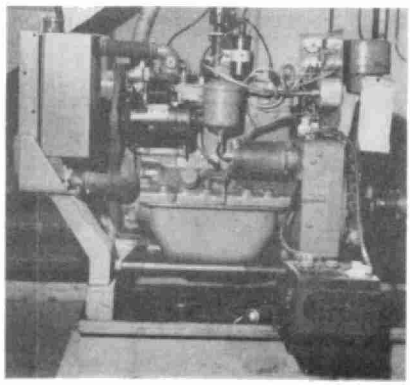
After the detention chamber, the water enters a slurrying chamber ahead of the filter. This chamber is designed to create a turbulence during the precoat recirculation cycle to completely slurry the precoat powder. During the filtration cycle, body-feed diatomite is metered into this chamber by a Wallace and Tiernan Model A-710 wet slurry feeder

Water from the slurrying chamber, with carbon and diatomite in suspension, enters through an opening at the bottom of the concrete filter chamber. In this way, a sweeping action across the floor of the filter chamber is achieved, which picks up any carbon or diatomite that may have settled between the filter elements. This higher velocity flow occurs under the filter elements and thus has no effect on "cake washing".

In the filter, the water is drawn through stainless steel filter elements by an eight stage, 15 HP turbine pump. The elements are covered with polyethylene cloth and precoated with diatomaceous earth. The diatomaceous earth layer removes the carbon and all suspended solids from the water. The body feed diatomite builds up with these solids to form a permeable cake, thus increasing



MAIN DUTY PUMP AND DISCHARGE PIPING



THIS GASOLINE ENGINE DRIVES THE STANDBY PUMP, IN CASES OF POWER FAILURE

the solids holding capacity of the filter and lengthening the filter system.

The filtered water is drawn through the filter elements to a bottom collector manifold. This manifold runs through the concrete wall of the filter chamber where it is connected to the suction of the turbine pump. A standby gasoline engine driven-pump is connected in parallel with the turbine pump to provide service during power failure.

The suction head of either pump is used to draw the water through the filter, while the discharge head is used to pressurize the mains and fill the standpipe. A 0 to 30" Hg. vacuum gauge is connected into the suction line ahead of the pumps and this gauge indicates the relative clogging load on the filter.

Chlorine is injected into the water and the total gallons treated are shown on a meter before the water leaves the building. The water levels in the standpipe are controlled by a mercury column altitude valve in conjunction with a telemetering system to the filtration plant. When the water in the standpipe has reached its maximum level, a signal from the telemeter system starts a 1 HP holding pump, which recirculates water through the filter to hold the cake on the elements. The turbine pump and feeders then stop. All electric controls have "hand-off automatic" selectors so that the system may be run on manual or automatic.

PROJECT COSTS

NET CAPITAL COST (Estimated)	$212,977.01
DEDUCT - Payments from Municipalities	425.00
Long Term Debt to OWRC	$212,552.01
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965	$ 10,006.58
Net Operating	$ 923.28
Debt Retirement	4,770.00
Reserve	1,335.43
Interest Charged	11,897.62
TOTAL	$ 18,926.33

RESERVE ACCOUNT

Balance at January 1, 1965	$ 3,345.06
Deposited by Municipality	1,335.43
Interest Earned	213.81
	$ 4,894.30
Less Expenditures	-
Balance at December 31, 1965	$ 4,894.30

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	CHEMICAL	REPAIRS & MAINTENANCE	SUNDRY
JAN	1.50			1.50
FEB	13.72			13.72
MARCH	273.80	270.80		3.00
APRIL	151.65	22.50		129.15
MAY	3.00			3.00
JUNE	38.54			38.54
JULY	22.50	22.50		-
AUG	262.52	259.70		2.82
SEPT	-	-		-
OCT	40.50	37.50		3.00
NOV	91.55		90.05	1.50
DEC	24.00	22.50		1.50
TOTAL	923.28	635.50	90.05	197.73

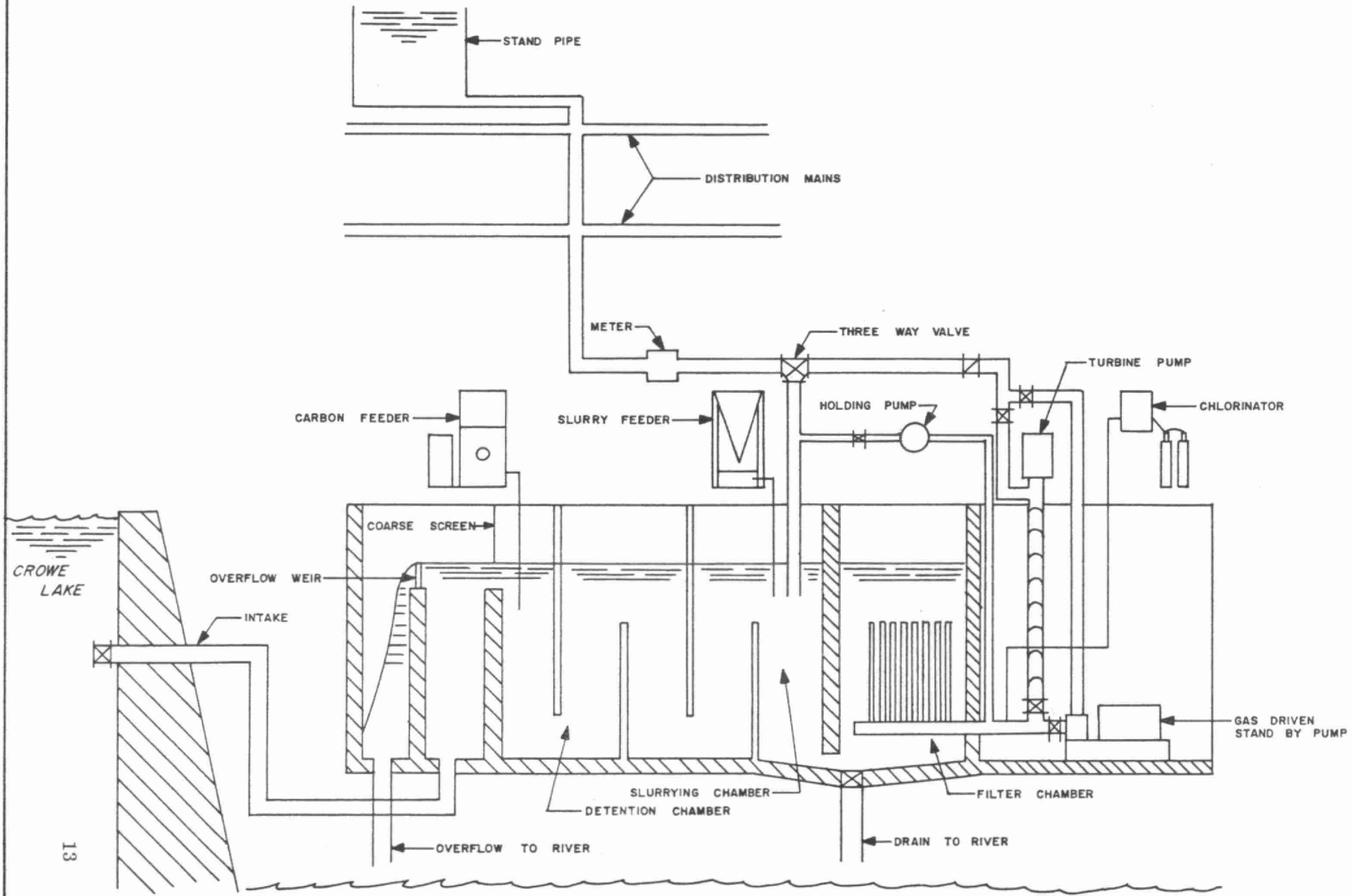
YEARLY OPERATING COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR *	COST PER THOUSAND GALLONS
1962	11.992	824	2.46	0.07
1963	16.607	937	2.81	0.06
1964	18.690	515	1.52	0.02
1965	23.713	923	2.69	0.04

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

Technical Section

SCHEMATIC DIAGRAM OF MARMORA WATER SYSTEM



Design-Data

DESIGN

Type of Plant - Diatomite filtration plant.

Design Population - 2,000

Design Plant Flow - 250,000 gpd.

Per Capita Flow - 125 gallons

EQUIPMENT

Activated Carbon Feeder - Wallace and Tiernan - Type A-690

Diatomite Body Feeder - Wallace and Tiernan - Type A-665

Chlorinator - Wallace and Tiernan - Type A-741.

CIRCULATING PUMP

Armstrong Pump - Model 1552

Capacity - 42 IGPM @ 29 foot head

Motor - Century, type SC, 550 volts, 3 phase, 1.4 amps.

RPM - 1750.

HP - 1

DUTY PUMP

Layne Turbine Pump - 8 stage - Type 4 inch SDH

Capacity - 160 IGPM @ 127 foot head.

Motors - US Motors - Holloshaft, Type HU 550 volts, 3 phase, 16 amps.

RPM - 1800

HP 15

STAND-BY

Canada Pump - Centrifugal Split Case - 3 inch by 4 inch Class "SAC".

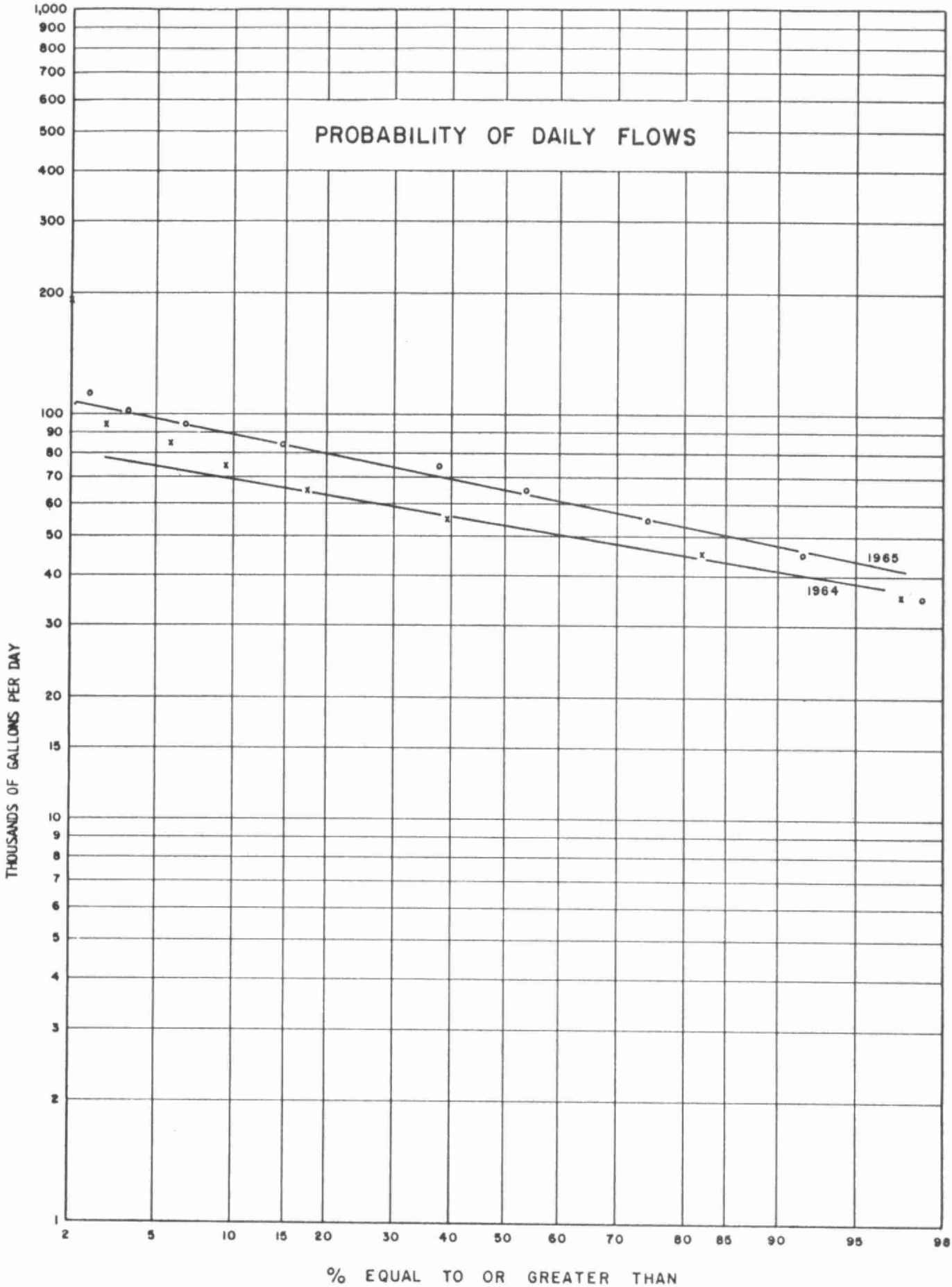
Capacity - 180 USPGM @ 217 foot head

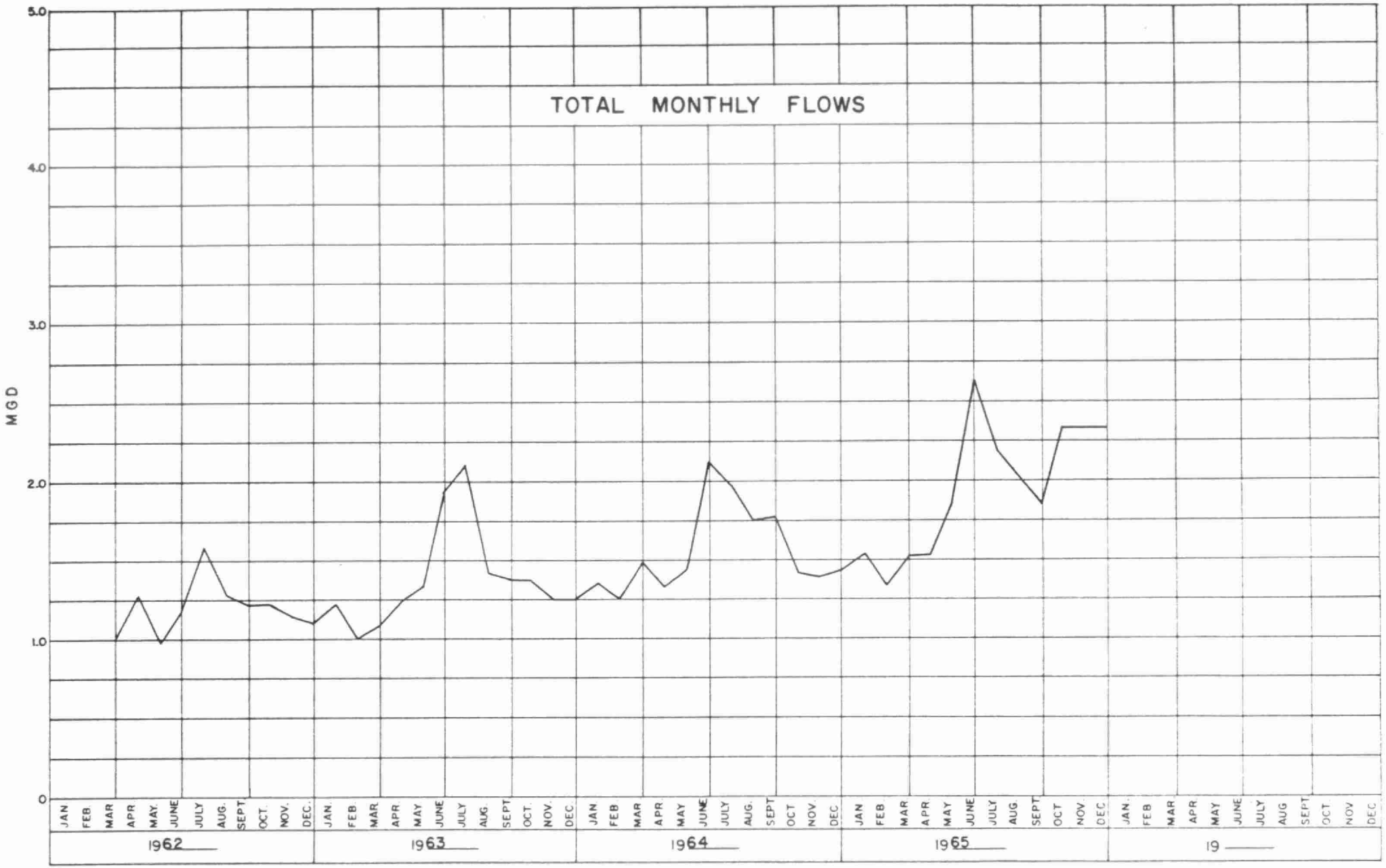
Motor - Continental Engine - gas motor

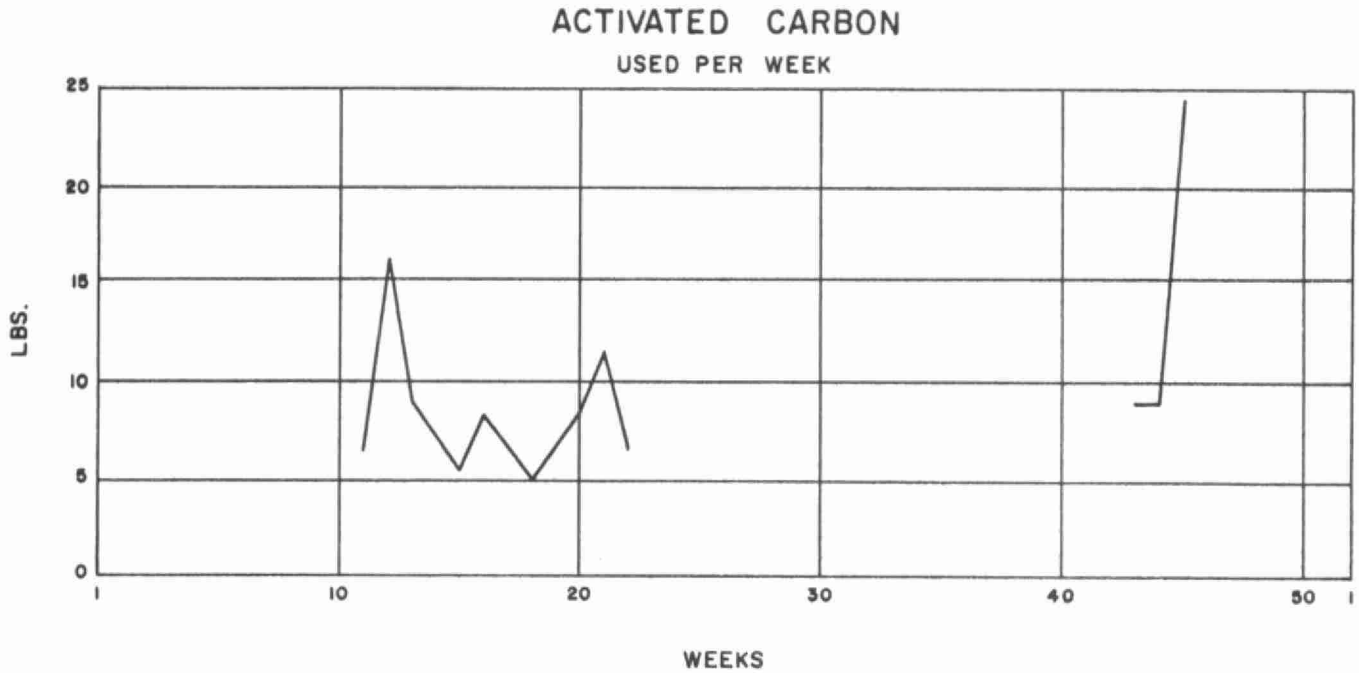
Type - F-162

Stand-by Capacity - 500,000 gallons.

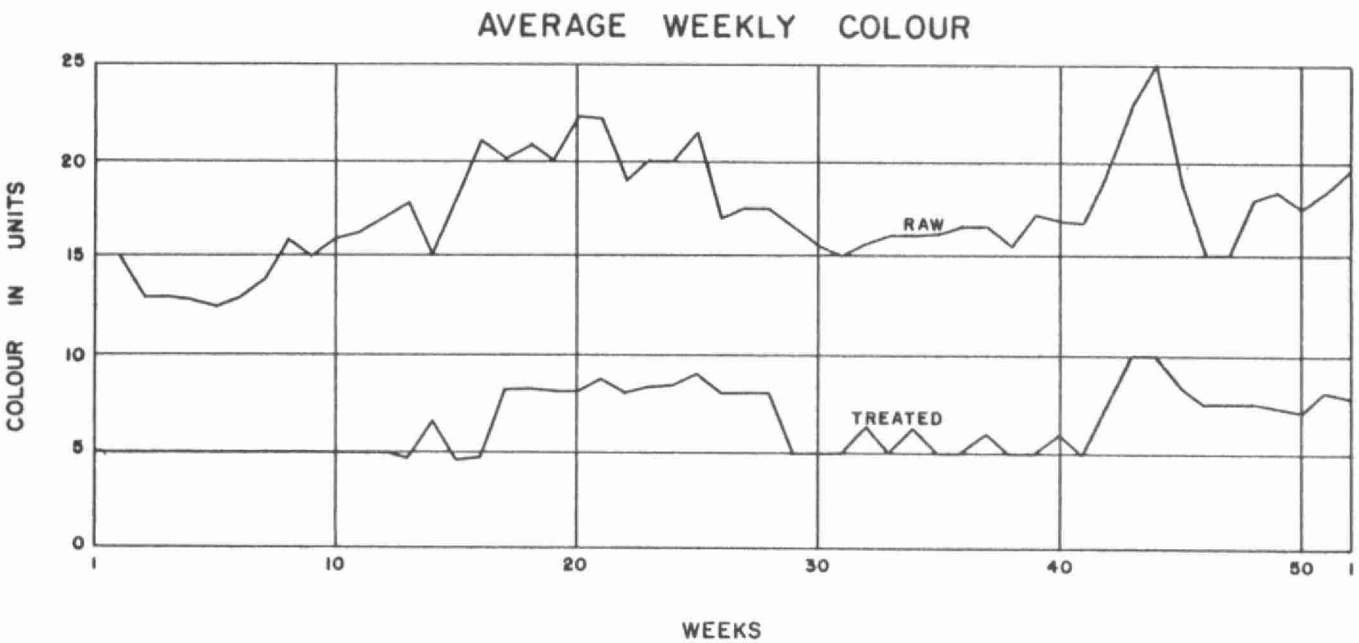
Process Data



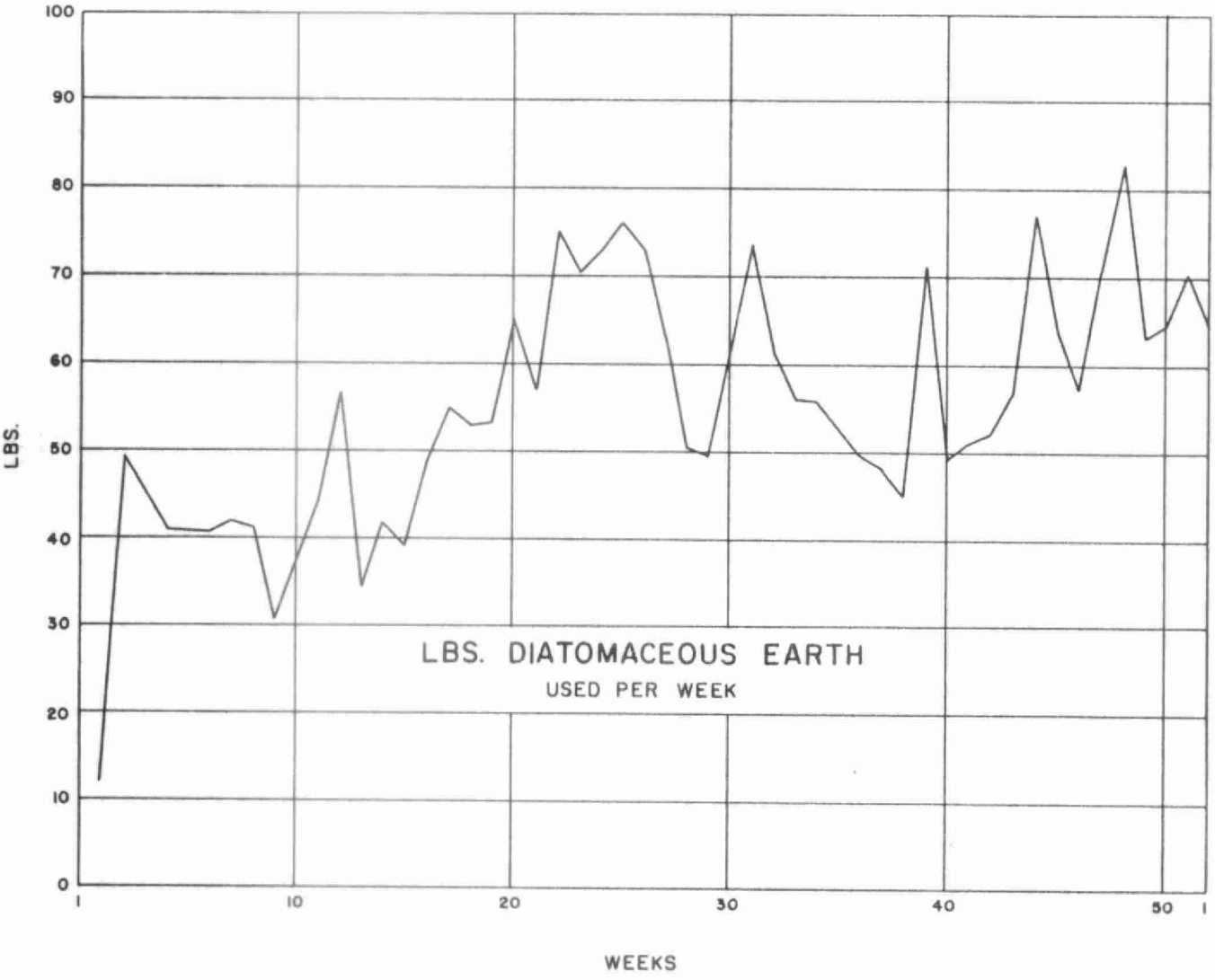

TOTAL MONTHLY FLOWS
MGD
5.0
4.0
3.0
2.0
1.0
0
JAN FEB MAR APR MAY JUNE JULY AUG. SEPT OCT. NOV. DEC.
1962
1963
1964
1965
19



Activated carbon is used in the treatment process to reduce the colour of the raw water. Carbon treatment was required for the months of March, April, May, and October in 1965.



The peak treated water colour count was 10 units and occurred in the month of October. The OWRC objective for colour in the treated water is less than 15 hazen units.



Diatomaceous Earth or Cellite, its trade name, is used in water treatment systems to remove turbidity in the raw water supply. From the graph it may be seen that the greatest demand for Cellite is in the summer time when the raw water can become more turbid from surface runoff and stream erosion.

CHEMICAL SAMPLE RESULTS

DATE	SAMPLE	HARDNESS AS CaCO3	ALKALINITY AS CaCO3	IRON	CHLORIDE	APPARENT COLOUR UNITS	TURBIDITY
JANUARY 6	RAW					< 5	1.3
	FILTERED					< 5	1.3
MARCH 12	RAW					15	1.1
	FILTERED					10	0.6
APRIL 7	RAW					15	1.5
	FILTERED					< 5	0.7
MAY 13	RAW					25	1.0
	FILTERED					10	0.7
JUNE 9	RAW					25	0.8
	FILTERED					15	0.2
JULY 28	RAW					10	2.5
	FILTERED					5	1.7
AUGUST 18	RAW					10	0.5
	FILTERED					10	0.6
SEPTEMBER 22	RAW					20	2.5
	FILTERED					10	1.7
OCTOBER 20	RAW					25	0.6
	FILTERED					15	0.3
NOVEMBER 24	RAW	90	71	0.14	21	25	1.3
	FILTERED	-	68	-	4	-	0.1

BACTI RESULTS

Date	Raw	Filter	Dist. Sys.
January 6	10	0	0
February 17	10	0	0
March 10	11	0	0
April 7	11	0	-
May 13	20	0	0
June 9	34	0	0
July 21	24	0	0
August 18	26	0	0
September 22	110	0	0
October 20	42	0	-

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	1.544	24.15	1.56
FEBRUARY	1.348	25.14	1.86
MARCH	1.527	30.14	1.97
APRIL	1.536	33.00	2.15
MAY	1.866	42.90	2.30
JUNE	2.644	60.10	2.27
JULY	2.206	54.00	2.45
AUGUST	2.061	49.30	2.39
SEPTEMBER	1.864	41.50	2.23
OCTOBER	2.345	50.00	2.13
NOVEMBER	2.348	44.06	1.88
DECEMBER	2.424	48.25	1.99
TOTAL	23.713	502.54	-
AVERAGE	1.976	41.88	2.12

COMMENTS

A total flow of 23.713 million gallons of treated water was pumped to the distribution system requiring 502.54 pounds of liquid chlorine to provide a dosage rate of 2.12 parts per million. A chlorine residual of 0.5 ppm is carried in the treated water to ensure satisfactory disinfection.

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CONCLUSIONS

There was a 27% increase in water consumption in 1965 because of new main extensions being constructed early in the year. This resulted in an increased usage of chlorine but not of Diatomaceous Earth or Activated Carbon.

The plant is presently operating at approximately one-half its design capacity.

The plant was operated in a satisfactory manner in 1965. There are no recommendations at this time.


ONTARIO WATER RESOURCES COMMISSION